

Evidence for Ice Cubes in Comets: the Dust "spike" of Comet 1996B2 (Hyakutake).

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The dust coma of C/1996B2 (Hyakutake) exhibited a beautiful parabolic head as well as a narrow anti-solar "spike." Dynamical modeling of the dust coma using a Monte Carlo numerical simulation code indicates that the coma consists of two components: a slow moving (≈ 10 m/s), high β ($\beta = F_{\text{rad}}/F_{\text{grav}} > 0.1$) component emitted in a relatively narrow (60°) sun-centered cone and a faster component (≈ 1 km/s) emitted essentially isotropically. The velocity of the slow moving component is almost independent of β whereas the velocity of the faster component has the more typical $v \propto \sqrt{\beta}$. These results are consistent with the emission of large chunks of ice from the nucleus which sublime rapidly after ejection. These chunks accelerate from the sublimation process, creating the illusion of high β particles. The parabolic dust envelope is well modeled by dust released from the sublimating chunks, and the model overestimates the length and width of the narrow spike unless grain destruction is included. This model is consistent with the radar detection of large, high velocity particles near the nucleus and IR water vapor images which suggest a distributed source for the water. Predictions for the appearance of the effects of the icy grains now in the tail of Hale-Bopp (1995O1) will also be presented.

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